directing said flow from said second direction to a third direction, different from said second direction, towards said outlet conduit, using said second valve clapper, when in said open configuration.

REMARKS

Claims 1-14 are pending.

The present invention relates to a backflow preventor which has a small footprint and a high flow efficiency. According to the present invention, the average streamline flow has a change of direction totalling about 180°. In one embodiment, inflow to the valve is vertically upward and outflow from the valve is vertically downward. The change in flow direction is achieved without excessive pressure drop by providing valve discs which, in the open position, tend to enhance the desired flow by directing the flow along the desired path. In one embodiment, as seen in Fig. 9, the vertically upward inflow is deflected by the open valve disc to a substantially horizontal flow, i.e., a direction different from the inflow direction. The second valve, in the open position, redirects this flow by deflecting the horizontal flow to vertically downward direction, i.e., a direction different from the horizontal flow. In this way, the pressure drop, and thus the head loss is diminished.

Claims 1-4, 8-12, and 14 are rejected over Brewer in view of Piening. The Examiner states that, for example, Fig. 10 of Brewer shows an inverted "U" shape and Piening shows, in series, two pivoted clapper-type valves. The Examiner states that it would have been obvious to substitute, for the

reciprocating check valves of Brewer, the serial pivoting clapper-type valves. The Examiner goes on to state:

> In this modification the check valves would be serially arranged in the horizontal section of the piping of Brewer. When these check valves are fully opened, fluid is "directed" in a second direction towards the second valve by the first valve. Additionally, there is no claim language distinguishing one direction from another. They could read on the same or different directions.

Claim 1 has been amended to include the second direction being different from the first direction. If the modification suggested by the Examiner (placing the serially arranged check valve in the horizontal section of Brewer) were made, such modification would not have a first valve positioned to direct flow from the first direction to a second direction different from the first direction.

Furthermore, claim 1 has also been amended to include the second valve directing flow from the second direction to a third direction which is different from the second direction. In the modification suggested by the Examiner, the second valve would not direct flow from a second direction to a third direction which is different from the second direction.

Because the cited references, alone or in combination, fail to disclose a first clapper which directs flow from a first direction to a second direction different from the first direction and a second clapper which directs flow from the second direction to a third direction different from the second direction, claim 1, as amended, is patentable over Brewer and Piening.

Furthermore, claim 1 is patentable because the claimed invention provides new and unobvious advantages. Enclosed herewith is a declaration by the inventor establishing that, for the design flow range, the claimed invention produces a pressure

head loss less than that provided when there is no deflection by the valve discs. As noted above, in the combination suggested by the Examiner, the valves in the open position would not cause a deflection and thus would produce a head loss characteristic of the asterisk curve shown in the attached affidavit.

Claims 2-4 are patentable as dependent from claim 1 and for other reasons as well. The Examiner states that claims 2-4 are met by Brewer, et al. Claim 2 is patentable because Brewer fails to disclose a shutoff valve with a handle which extends substantially horizontally from the housing in the inverted U-shape configuration cited by the Examiner, and as seen in Figs. 1D and 3, the handles 456, 762 extend in a vertical direction, rather than a horizontal direction. Furthermore, Brewer fails to disclose a shutoff valve handle which extends outwardly in a direction perpendicular to a line between the inlet and outlet conduits. As seen in Figs. 1D and 3, the shutoff valve handles do not extend <u>outward</u> from the housing in Brewer.

Because Brewer fails to disclose a shutoff valve handle which extends <u>horizontally outward</u> from the housing in a direction perpendicular to a line passing through the inlet and outlet conduits, claim 2 is patentable over the cited references.

Regarding claim 3, Brewer fails to disclose a shutoff valve handle which, during opening and closing, moves horizontally outward from the housing in a direction perpendicular to a line passing through the inlet and outlet conduits. Because Brewer fails to disclose a shutoff valve handle which, during opening and closing, moves horizontally outward, claim 3 is patentable over the cited references.

Claims 8 and 9 are patentable at least as dependent from claim 1.

Claim 10 is patentable because the cited references fail to disclose a second valve which, in the open position, lies in the plane substantially perpendicular to the plane of the first valve when it is in the open configuration. Based on the figures of Piening, it is believed that the first and second valves, when in the open position, will lie in substantially parallel planes.

Because the cited references fail to disclose a first valve that lies in a first plane in the open configuration and a second valve in a plane substantially perpendicular to the first plane when in the open configuration, claim 10, as amended, is patentable over the cited references.

Claim 11 is patentable at least as dependent from claim 10.

Claim 12 has been amended in a manner similar to the amendments made to claim 1 and accordingly, claim 12 is patentable for reasons similar to those discussed above in connection with claim 1.

Claim 14 has been amended in a manner similar to the amendment made to claim 1 and accordingly, claim 14 is patentable for reasons similar to those discussed above in connection with claim 1.

Claim 6 is rejected for obviousness-type double patenting over claim 1 of U.S. Patent 4,989,635, in view of Brewer.

Claim 6 is patentable at least as dependent from claim 1 and for other reasons as well. The Examiner states that it would have been obvious to employ the device of the patented claim in a serial check valve backflow system in an inverted U-shape. The inverted U-shape is shown, in the Brewer patent, in

Fig. 3. The check valves of Fig. 3 are depicted generally by reference numerals 104a and 104b. The Examiner proposes to replace these valves by valves such as those shown in U.S. Patent 4,989,635. Applicants do not necessarily agree that it would be obvious to make such a substitution. However, even if such a substitution were made the apparatus would not provide the subject matter of claim 1. In particular, if the valve 104a of Fig. 3 of Brewer were replaced by a clapper valve, in order to direct flow towards the second valve (104b) it would receive flow in a direction approximately 45° upward (i.e., in a direction from the point 341 towards the point 15a in Fig. 3 of '622). However, this flow direction is different from the direction of fluid flow through the inlet conduit (indicated in Fig. 3 by line 348). Thus, in Fig. 3, the inflow direction is vertically upward (line 348) then changes to a direction up and to the right (towards valve 104a) and changes again in a direction towards the second valve 104b. A clapper placed in position 104a would direct flow from the second direction (up and to the right) towards the second valve, but would not be effective to direct flow from the first direction, i.e., the vertically upward flow.

Claim 1, on the other hand, includes the housing that receives fluid flow from an inlet conduit in a first direction and a first valve clapper that directs flow from "said first direction" towards a second valve. The combination proposed by the Examiner would not do this. The combination proposed by the Examiner would not deflect flow from the first direction (i.e., the inlet flow direction, or vertically upward in Fig. 3) towards the second valve.

Accordingly, claim 6 is patentable as dependent from claim 1, which is patentable for the reasons discussed above and

is also patentable because the combination proposed by the Examiner would fail to provide a first clapper which is positioned to direct flow "from said first direction" towards the second valve.

Claim 7 is patentable for obviousness-type double patenting over claim 8 of U.S. Patent 4,989,635 in view of Brewer, et al. Claim 7 is patentable for reasons similar to those discussed above in connection with claim 6, i.e., because claim 7 is dependent from now-allowable claim 1 and because the combination proposed by the Examiner would fail to provide a first valve clapper positioned to direct flow from "said first direction" towards the second valve.

Claim 13 is rejected under 35 U.S.C. § 112. The Examiner states that claim 13 is confusing due to the plural recitations of "an inlet port" and indicates that the claim "would appear to require two separate inlet ports in the housing with only one defined inlet conduit."

Claim 13 has been amended to refer to a first inlet port and a second inlet port. It is true that claim 13 includes one inlet conduit and two inlet ports. The two inlet ports are inlet ports of the first and second valves. These items are described in the specification. Inlet conduit 222 is described at page 8, line 31-32. The first inlet port is the inlet port 224 of the first check valve 12, page 8, lines 32-33. The second inlet port is the inlet port 234 of the second check valve 213, page 9, lines 5-6.

Because claim 13 has been amended to refer to a first inlet port and a second inlet port, claim 13 is now in compliance with 35 U.S.C. § 112.

The Examiner indicates that claim 5 would be allowable if rewritten in independent form, including all limitations of the base claim and any intervening claims. Claim 5 has been amended to include all the limitations of claim 1 from which it depends. Accordingly, claim 5 is now allowable.

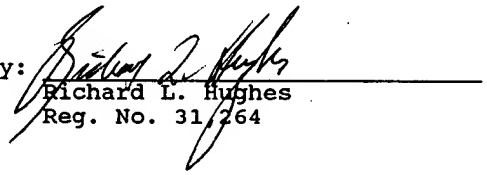
The references noted by the Examiner but not relied upon have been reviewed but are believed no more pertinent than the cited references. Smith discloses an automatic marine water closet with serial in-line swinging gate valves 15. Cornwall discloses a sewer pipe trap with in-line valves hinged to the outer or flanged end. Although the references have been at least briefly reviewed, on this basis none are believed to disclose a valve clapper which, in the open position, directs flow from a first direction to a second direction different from the first direction, toward a second valve.

The Notice of Draftsman's Patent Drawing Review has been received. Formal drawings will be provided upon receipt of a Notice of Allowance.

The application now appearing to be form for allowance, reconsideration and allowance thereof is respectfully requested.

Respectfully submitted,

TOWNSEND and TOWNSEND

By: 
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Enclosures